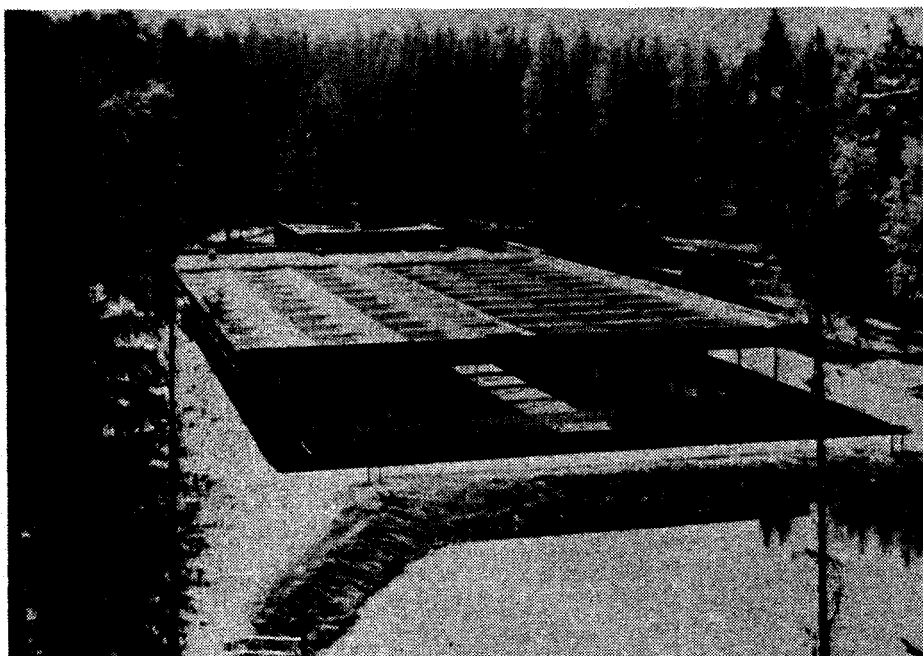




McCALL SUMMER CHINOOK SALMON HATCHERY

Brood Year 1986 Production Report



by
Thomas S. Frew
Hatchery Superintendent II

March 1989

TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	1
INTRODUCTION	2
LOCATION	2
OBJECTIVES	2
FISH REARING FACILITIES	3
WATER SUPPLY	3
STAFFING	4
FISH PRODUCTION	4
EARLY REARING	4
FISH DISTRIBUTION	9
Fish Tagging	10
Fish Release Information	10
FISH HEALTH	11
SPECIAL STUDIES	12
Density Experiment	12
Initial Feeding Study	12
LITERATURE CITED	16
APPENDICES	17

LIST OF TABLES

Table 1. Hatchery constants and feeding rates used at McCall Hatchery on summer chinook salmon during the growth period (above 38°F) for Brood Year 1986 fish	9
Table 2. Brood Year 1986 coded wire tag codes and freeze brands used at McCall Hatchery. Numbers not adjusted for tag mortality	10
Table 3. Results of viral and bacteriological testing during the smolt assessment procedure	11

LIST OF FIGURES

	<u>Page</u>
Figure 1. Length frequencies of adult male chinook trapped at the South Fork Salmon River (1986)	5
Figure 2. Length frequencies of adult female chinook trapped at the South Fork Salmon River (1986)	6
Figure 3. Survival of the Brood Year 1984 summer chinook at various life stages	8
Figure 4. Length frequencies of Brood Year 1986 chinook smolts.	13
Figure 5. Average yolk absorption rates	14
Figure 6. Weight gain versus age of feeding fry	15

LIST OF APPENDICES

Appendix 1. The length frequencies of Breood Year 1986 McCall summer chinook salmon smolts at the time of release	18
Appendix 2. Drugs, chemicals and compounds commonly used at McCall Hatchery	20
Appendix 3. Correlation of summer chinook salmon smolts released by the McCall Hatchery and corresponding adult returns	21
Appendix 4. Summary of the Brood Year 1985 tags released.. . .	22
Appendix 5. McCall Hatchery summer chinook salmon adult return data by year	22

McCall Summer Chinook Salmon Hatchery

Brood Year 1986 Production Report

ABSTRACT

McCall Summer Chinook Salmon Hatchery was the first hatchery built to enhance the salmon runs into Idaho under the Water Resources Development Act of 1976. The hatchery was constructed in 1979 with a production goal of 1,000,000 smolts for stocking into the South Fork of the Salmon River. Brood Year 1986 was the third year class that achieved this goal. A total of 2,690 salmon were trapped in 1986. Of these, 314 males and 6 jacks were used to fertilize 2,148,727 eggs taken from 428 females. From this total, 374,496 eyed eggs were shipped to the Pahsimeroi Hatchery, 118,400 fry were released into the Johnson Creek drainage and 1,060,400 smolts were released into the South Fork of the Salmon River in March 1988.

There were no major disease problems encountered during the rearing cycle at the hatchery. Survival from green egg to smolt was 722. "Spring Thing" accounted for approximately a 12 loss during the months of April and May 1987.

Two experiments were conducted evaluating early rearing of summer chinook salmon. An evaluation of early rearing densities indicated fry could be reared at up to two times the recommended densities with little adverse effects. Also, an evaluation of timing of initial feeding indicated that fry could be held off of feed until they reached approximately 1,800 daily temperature units with no effect on growth.

The production of 1,060,400 smolts and 118,400 fry used 68,950 pounds of feed for a conversion of 1.21 pounds of feed per pound of fish. The feed cost was \$0.48 per pound of fish produced.

Author:

Thomas S. Frew
Fish Hatchery Superintendent II

INTRODUCTION

Hydroelectric dams on the Columbia and Snake rivers have reduced Idaho's salmon runs to critically low levels. In 1976, Congress enacted the Water Resources Development Act, a portion of which is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for losses of fish and wildlife caused by the Lower Snake River projects (Ice Harbor, Lower Monumental, Little Goose and Lower Granite dams). The McCall Summer Chinook Hatchery was the first hatchery built as partial fulfillment of the LSRCP.

LOCATION

McCall Hatchery was constructed in 1979 by the U.S. Army Corps of Engineers. Operational funds are provided by the U.S. Fish and Wildlife Service (USFWS), and the facility is staffed and operated by the Idaho Department of Fish and Game (IDFG). The hatchery is located within the city limits of McCall, Idaho, on the North Fork Payette River approximately 0.16 km. (1/4 mile) downstream from Payette Lake.

OBJECTIVES

The objectives of the McCall Summer Chinook Salmon Hatchery are:

1. Restore summer chinook salmon (Oncorhynchus tshawytscha) to the South Fork of the Salmon River, historically a major summer chinook stream in Idaho.
2. Trap and spawn adult salmon returning to the South Fork of the Salmon River.
3. Raise 1,000,000 summer chinook smolts for release in the South Fork of the Salmon River.
4. Rear 1,000,000 summer chinook to fry stage and plant into historical spawning and rearing areas of the South Fork drainage.
5. Evaluate fish rearing capabilities of the McCall Hatchery.

FISH REARING FACILITIES

Fish rearing facilities include:

1. 26 eight-tray stacks of Heath incubators,
2. two fiberglass Heath troughs 0.53 m x 4.72 m (1.75 ft. x 15.5 ft.),
3. 14 concrete vats 1.22 m x 12.19 m (4 ft. x 40 ft.),
4. two outdoor concrete rearing ponds 12.8 m x 60.96 m (42 ft. x 200 ft.), and
5. one collection basin 4.57 m x 30.78 m (15 ft. x 101 ft.).

Designed capacity of the hatchery is 1,000,000 smolts averaging 37.4 fish per kilogram (17 fish per pound).

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Cabin Creek, approximately 41.8 km. (26 miles) east of Cascade, Idaho. This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds, 3 m x 26.8 m (10 ft. x 88 ft.) and covered spawning area. Water is supplied from the South Fork of the Salmon River through an 84 cm (33-inch) underground pipeline. Holding capacity for the facility is approximately 1,000 adults. Adults trapped in excess of egg requirements are passed above the weir for natural spawning. Eggs collected at the facility are transported "green" to McCall for incubation, hatching and rearing. Resulting smolts are transported back to the South Fork of the Salmon River for release.

WATER SUPPLY

Hatchery water is obtained from Payette Lake through a 91.4 cm (36 inch) underground pipeline. Water may be taken from the surface or from a depth of 15.25 m (50 feet), thus providing the capability of obtaining the best water temperature available.

Through an agreement with the Payette Lake Reservoir Company, 570 liters per second (20 cubic feet per second) can be used for hatchery operations. Design criteria and production goals were established using this constraint, ensuring that the hatchery has enough water to meet its production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish. Total hardness ranges from 6.3-7.06 mg CaCO₃/l, while pH stays at about 6.8. There are no problems with heavy metals, and although at times we have had gas supersaturation, it has not posed any serious problems.

STAFFING

The hatchery is staffed with three permanent employees: a manager (Hatchery Superintendent II), an assistant manager (Hatchery Superintendent I) and a Fish Culturist. In addition, two eight-month and two three-month temporary employees are employed to assist during the busy field season.

FISH PRODUCTION

The weir and trap on the South Fork of the Salmon River were put in operation on June 26, 1986, and trapping operations continued until September 8, 1986. During this period, 2,690 salmon were trapped.

Fork lengths were taken on all the salmon that returned to the weir (Figures 1 and 2). Twelve hundred twenty-two jacks (<65 cm, 26 inches) represented 45% of the run this year. These fish are from the 1985 release of 564,405 smolts. Releases of 183,896 smolts 269,880 smolts in 1983 and 1984, respectively, returned the 1,468 adults trapped this year.

Of the returning fish, 397 had adipose fins absent, indicating a coded wire tag. Two hundred twenty-four snouts were collected and sent to the IDFG laboratory in Lewiston for tag recovery and code identification.

Spawntaking began on August 5, 1986 and concluded on September 8, 1986. During this period, 314 males and 6 jacks were used to fertilize the 2,148,727 eggs from 428 females. The mean fecundity was 5,020 eggs per female. There were a total of 566 fish, including 212 females, 257 males and 97 jacks released upstream of the weir to spawn naturally.

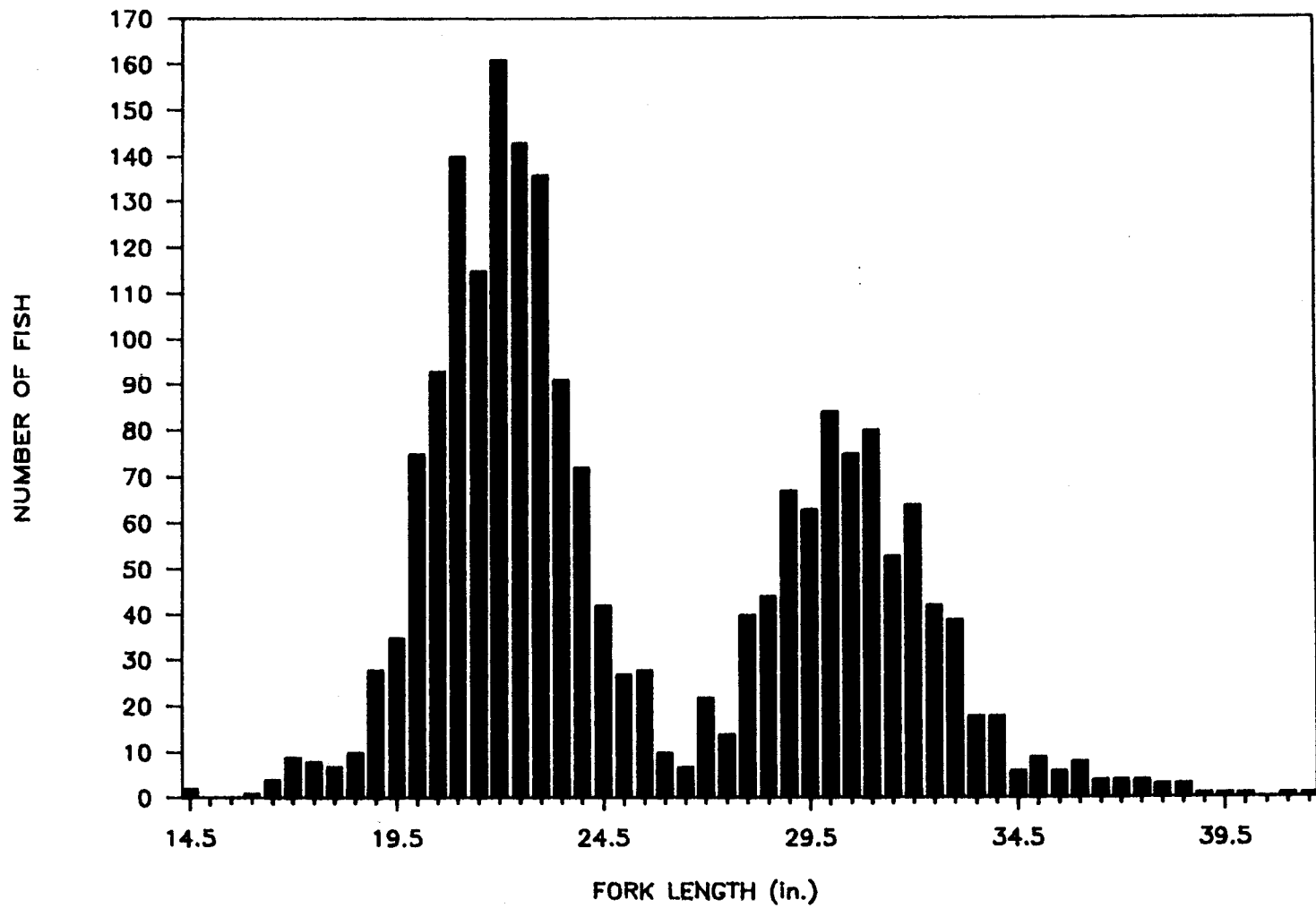
There were 186 male, 59 jack and 60 female mortalities, or 11.3% of the total trapped. These fish were returned to the river below the weir after kidney imprints were taken (See FISH HEALTH).

There were no drugs or chemicals used on the adults, and all of the carcasses were given away after spawning to the general public on a first come, first-served basis.

EARLY REARING

All of the eggs were water hardened immediately after fertilization in a 100-ppm titratable iodine solution for one hour. This solution was buffered with 0.5% sodium bicarbonate. The eggs were then rinsed in well water, iced down in coolers and transported to the hatchery.

Approximately 2,365 cc (80 fluid ounces) of eggs were placed in incubator trays supplied with 22.7 lpm (6 gpm) flow. The number of green eggs was estimated using the displacement method. The eggs eyed after



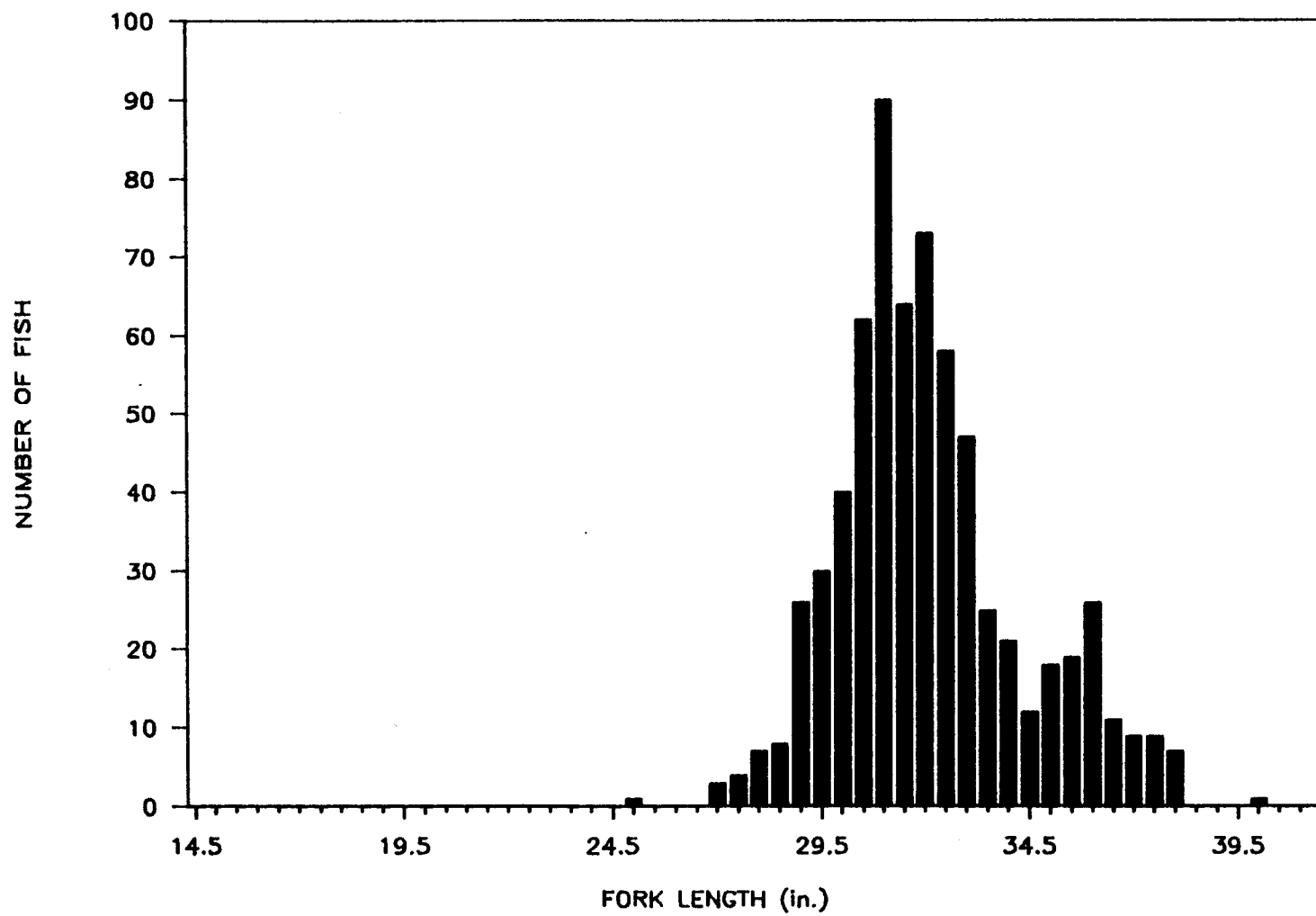


Figure 2. Length frequencies of adult female chinook trapped at the South Fork Salmon River (1986).

accumulating approximately 500 daily temperature units (DTU), at which time dead eggs were removed using an electronic egg picker. From the 2,148,727 green eggs collected, 1,712,747 eyed eggs (79.7%) were counted using the water displacement method and returned to the Heath incubators at 2,365 cc (80 ounces) per tray. The Pahsimeroi Hatchery received 374,496 of these eyed eggs.

The remaining eggs hatched at approximately 900 DTUs, and swim-up fry were transferred to the vats after accumulating 1,700 DTUs. Of the 1,338,251 remaining eyed eggs, 1,310,163 swim-up fry (98% survival) were set out to the vats (Figure 3). The normal initial loading rates ranged from 105,000 to 81,775 swim-up fry per vat. One vat was stocked with 163,000 fry as part of a density experiment (See SPECIAL STUDIES).

The vat rearing volumes were established and changed by setting screens and drop gates at various distances and depths, ensuring that fish densities were maintained at or below the allowable Density Index (DI) as recommended by Piper (1982), with exception of the density experiment vat. A flow index of approximately 0.3-0.4 was maintained throughout the indoor rearing phase and increased to a maximum of 0.99 immediately prior to ponding. The flows during indoor rearing ranged from 3-4 turnovers per hour, while the flows in the outdoor ponds were maintained at 1.3-1.5 turnovers per hour.

The fish were held in the indoor rearing vats until they were approximately 700 fish per km (320 fish per pound). They were then transferred during April to the outdoor ponds and reared there until they were released the following spring at 41.23 fish per kilogram (18.74 fish per pound). The survival rate of the 1,310,163 swim-up fry to ponding was 94%, or 1,227,353 fish (Figure 3).

Water temperatures of 3-4°C (36-38°F) during early rearing at McCall resulted in extremely slow growth rates. The daily length increase, (ΔL), during the cold-water rearing was only 0.127 mm (0.005 inches). As water temperatures increased, growth rates also increased. During the summer months, the daily length increases ranged between 0.254-0.584 mm (0.01-0.023 inches) due to warmer water.

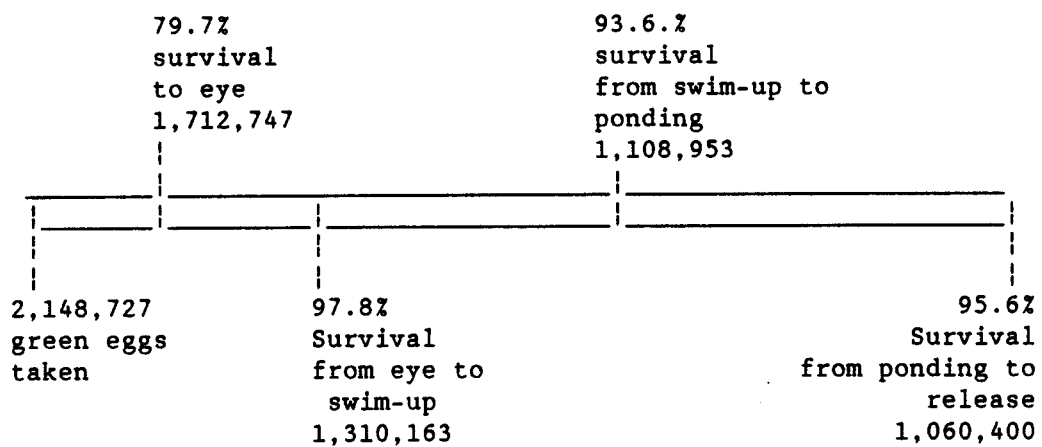
The swim-up fry were initially fed OMP-II starter mash (3% body weight) for the first two days on feed. For the next five days, they were fed a 1:1 mix of starter mash and OMP IV 0.8 mm (1/32) pellet, also at 3% body weight per day. For the remainder of the indoor rearing, they were fed the 0.8 mm (1/32) pellet at levels determined by the formula:

$$X \text{ BW} = \text{Hatchery Constant} / \text{total length}$$

Where:

$$\text{Hatchery Constant} = \text{Conversion} \times 3 \times \Delta L \times 100$$

(Table 1) (Piper et al. 1982). The OMP-IV diet had ten times the normal pantothenic acid added to control the incidence of "Spring Thing." Once the fish were ponded outside, feed size changed as growth increased with the 3.175 mm (1/8 inches) OMP-II pellet being the largest size fed to the



Note: The percent survival from ponding to release takes into account transfers of 118,400 fry and 374,496 eyed eggs.

Figure 3. Survival of the Brood Year 1984 summer chinook at various life stages.

presmolts. Feeding frequency varied with fish size and water temperature. Swim-up fry were fed hourly, fingerlings were fed six times per day and presmolts were fed two to four times per day depending upon the water temperature.

Table 1. Hatchery constants and feeding rates used at McCall Hatchery on summer chinook salmon during the growth period (above 38°F) for the Brood Year 1986 fish.

Month	Conversion	^L	Total length	Hatchery constant	Percent body weight	Temperature (°F)
March	1.30	0.0046	1.75	1.70	1.02	37
April	0.80	0.0076	2.01	2.97	1.48	39
May	0.85	0.0190	2.50	4.84	1.93	42
June	1.03	0.0200	3.10	6.18	1.99	52
July	1.38	0.0185	3.64	7.66	2.10	52
Aug.	1.28	0.0234	4.34	9.00	2.07	52
Sept.	2.00	0.0141	4.76	8.43	1.77	49
Oct.	1.35	0.0053	4.92	2.16	1.66	46
Nov.	2.00	0.0061	5.10	3.63	0.71	44
Dec.	2.00	0.0050	5.25	3.00	0.57	39

Fish were inventoried on the first of each month. Length-weight relationships were determined, feeding levels adjusted and the fish monitored for general health.

Hatchery vats were cleaned daily, and brushes and nets designated for each vat were disinfected in a 600-ppm Benzalkonium Chloride (50%) solution after each use. Mortalities were collected daily, recorded and frozen for disposal. The outside rearing ponds were cleaned as needed by means of a vacuum system, with eventual discharge into the settling pond. Outside mortality was collected daily, recorded and frozen for disposal.

FISH DISTRIBUTION

Fish Tagging

During the period September 15 to October 2, 1987, fish were coded wire tagged, fin clipped and freeze branded. Of the 313,659 fish which were coded wire tagged and adipose clipped, 61,989 received a right dorsal "T" in the second position (RD-"T"-2) (Table 2). A summary of the tags released is shown in Appendix 4.

Table 2. Brood Year 1986 coded wire tag codes and freeze brands used at McCall Hatchery. Numbers not adjusted for tag mortality.

Dates tagged	Pond number	Number tagged	Tag code	Remarks
9/15-9/28/87	1	156,191	10/30/32	All coded wire are for
	2	<u>95,479</u>	10/30/32	U.S./Canada contribution
	Total	251,670		
9/29-10/2/87	2	61,989	10/30/33	These are the same fish
	2	<u>61,989</u>	RD "T" 2	
	Total marked	313,659		

Fish Release Information

On October 10, 1986, 374,496 eyed eggs were shipped to the Pahsimeroi Hatchery in an effort to reestablish the run of summer chinook salmon into the Pahsimeroi River.

On May 5, 1987, 90,000 fry (61 kg, .134.3 pounds); and on June 12, 1987, 28,400 fry (41.4 kg, 91.1 pounds) were released into Johnson Creek and its tributaries to reintroduce summer chinook to this tributary of the South Fork of the Salmon River.

During the period March 21 to March 24, 1988, 1,060,400 smolts weighing 25,697 kg (56,600 pounds) were released into the South Fork of the Salmon River at the Knox Bridge. Of these, 309,700 smolts were carrying coded wire tags (Appendix 4). The smolts averaged 41.26 fish per kg (18.7 fish per pound) and 143 mm (5.6 inches) fork length. This represented a 95.6X survival from ponding to release. Total survival from green egg to release was 72.3%.

IDFG pathologist Pat Chapman conducted a smolt quality assessment and found the fish to be in excellent condition. He tested for Renibacterium salmonarum (BKD), IPN virus and IHN virus (See FISH HEALTH). In addition, fish were sampled for descaling at the hatchery and also at the release site, with no descaling evident at either sample site.

FISH HEALTH

During the spawning season, kidney imprints were taken on all adult holding pond mortalities. After the imprints were fixed in methanol, they were sent to the IDFG pathology lab for analysis via direct Fluorescent Antibody Technique (FAT) for the presence of BKD. The results of these tests showed 21 positive of 219 samples taken. Four of the positive fish (1.8X) were light positive, three fish (1.4%) were moderately positive, four fish (1.81) were heavy positive and ten fish (4.6%) were "too numerous to count." In addition, adults were sampled for various diseases during spawning on August 28, 1986. Results were positive for Infectious Hematopoietic Necrosis (IHN) virus and Ceratomyxa shasta; however, no titers were established for the virus or the C. shasta organisms. Results were also positive for BKD in 8.3% of the fish sampled. Of the BKD positive fish, 5.0% were lightly positive, 0.0% were moderately positive and 3.3% were heavy positive.

Haemogregarina sp. was observed in one of 17 blood films. This is the first observation of this organism in this stock of fish.

There were several minor disease problems with the brood year 1986 fish through their first winter. Internal fungus, diagnosed as Phoma herbarum, accounted for a slight increase in mortality during February 1987. "Spring Thing" mortality began during April and reached full impact during May but only accounted for a mortality of 11. The use of ten times the normal level of pantothenic acid in the 1/32 inch OMP-IV diet has shown to be beneficial in controlling the "Spring Thing" problem at McCall Hatchery (Hutchinson 1985).

After the fish were ponded outside, there were no problems with the usually chronic BKD infections. The normal infestation of Tricophera sp. became evident during the summer months but accounted for no known mortality.

Results from smolt assessment conducted by IDFG pathologists are given in Table 3.

Table 3. Results of viral and bacteriological testing during the smolt assessment procedure.

Pathogen	Sample size	Results
IPN	60	negative
IHN	60	negative
EIBS	60	negative
<u>R. salmoninarium</u>	60	9/60 positive
<u>M. cerebralis</u>	60	negative

SPECIAL STUDIES

Density Experiment

As surplus eggs become available due to the success of the South Fork chinook program, there is a desire from IDFG biologists to outplant fry into historical spawning areas of the drainage. If the hatchery can safely rear fry surplus to the needed 1,000,000 for smolt production, these fry can be used to reestablish populations in these historical spawning areas.

The hatchery was built for a density index (DI) of 0.3 as suggested by Piper (1982). To stay within this design criteria, normal rearing densities have been set at 90,000 fry per vat. To determine the effects of increased rearing densities, the Brood Year (BY) 1986 fry were reared at varying rates of up to 160,000 fry per vat (density index of 0.6).

The test group contained 164,000 fry, while the control group had a "normal" population of 106,000 fry. Both groups performed equally well, with the only difference being a slightly tighter length frequency curve at ponding in the high density group.

At the termination of the experiment, the fish were weighed and measured, and a condition factor calculated. Conversion, mortality and growth rates were calculated and overall population condition was evaluated. Again, the only noticeable difference encountered was a decrease in the length frequency distribution in the high-density group, suggesting more uniform growth (Figure 4).

Initial Feeding Study

A study to determine timing of initial feeding was conducted on the 1986 fry. This study was conducted using four groups of fry, each started on feed at approximately 1,600 DTUs, 1,700 DTUs, 1,800 DTUs and 1,900 DTUs, respectively. Each group consisted of three replicates of 1,200 fry which were held in floating baskets designed to simulate normal vat loading densities.

As the designated age was reached, the fry were transferred from incubators to the baskets and placed on feed. The fry were fed "ad libitum" hourly between 0800 and 1700 hours each day, using OMP IV with ten times the normal pantothenic acid, the standard diet used at McCall for all early rearing of chinook fry.

Samples of ten fry were taken periodically throughout the study period from each basket and were fixed in modified Bouins solution. The fry were weighed, total lengths taken and the body cavity was opened to excise the gut and the remaining yolk. The stomach and yolk volumes were measured by displacement.

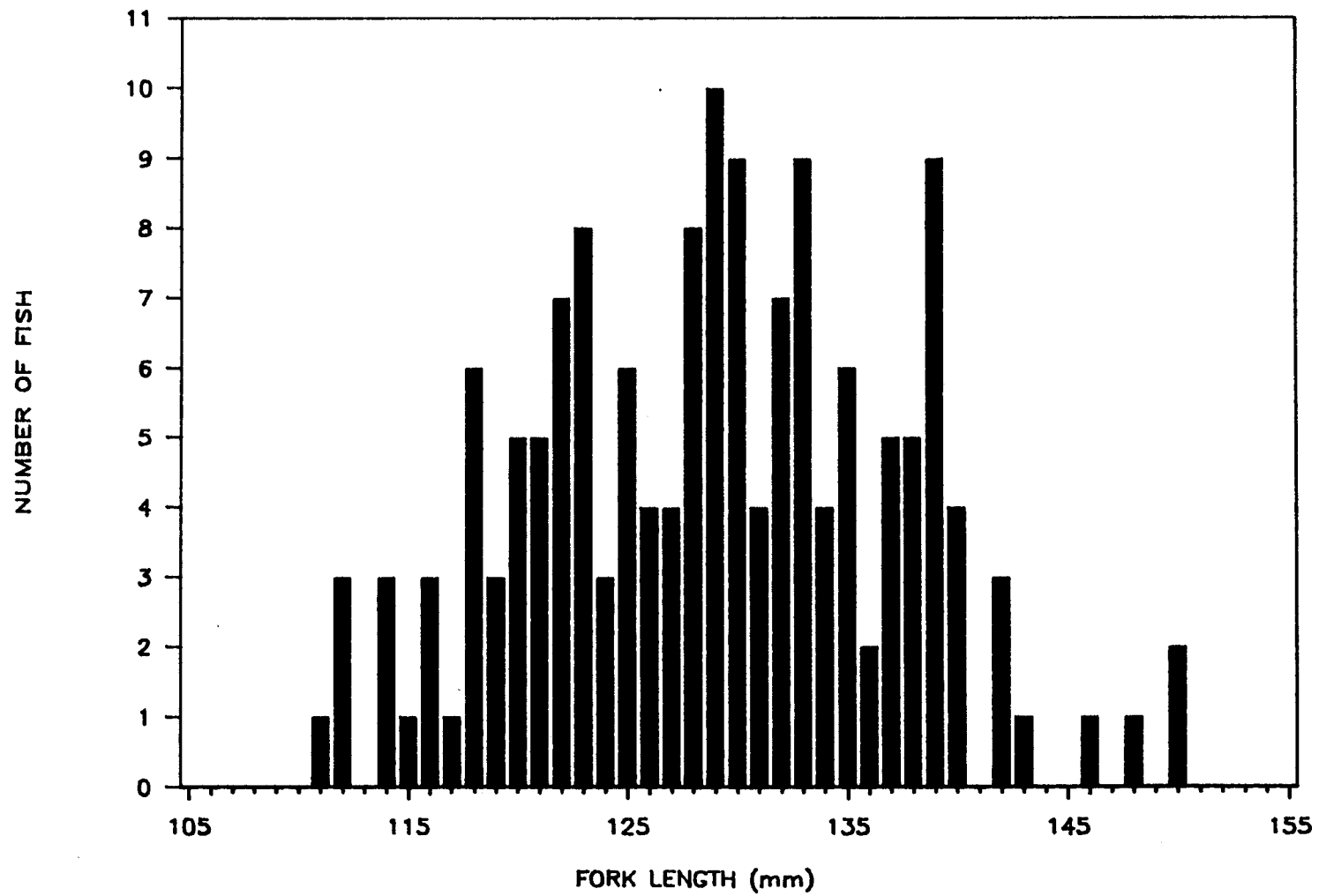


Figure 4. Length frequencies of Brood Year 1986 chinook smolts.

BY 1986 INITIAL FEEDING

COMPARISON OF YOLK ABSORPTION

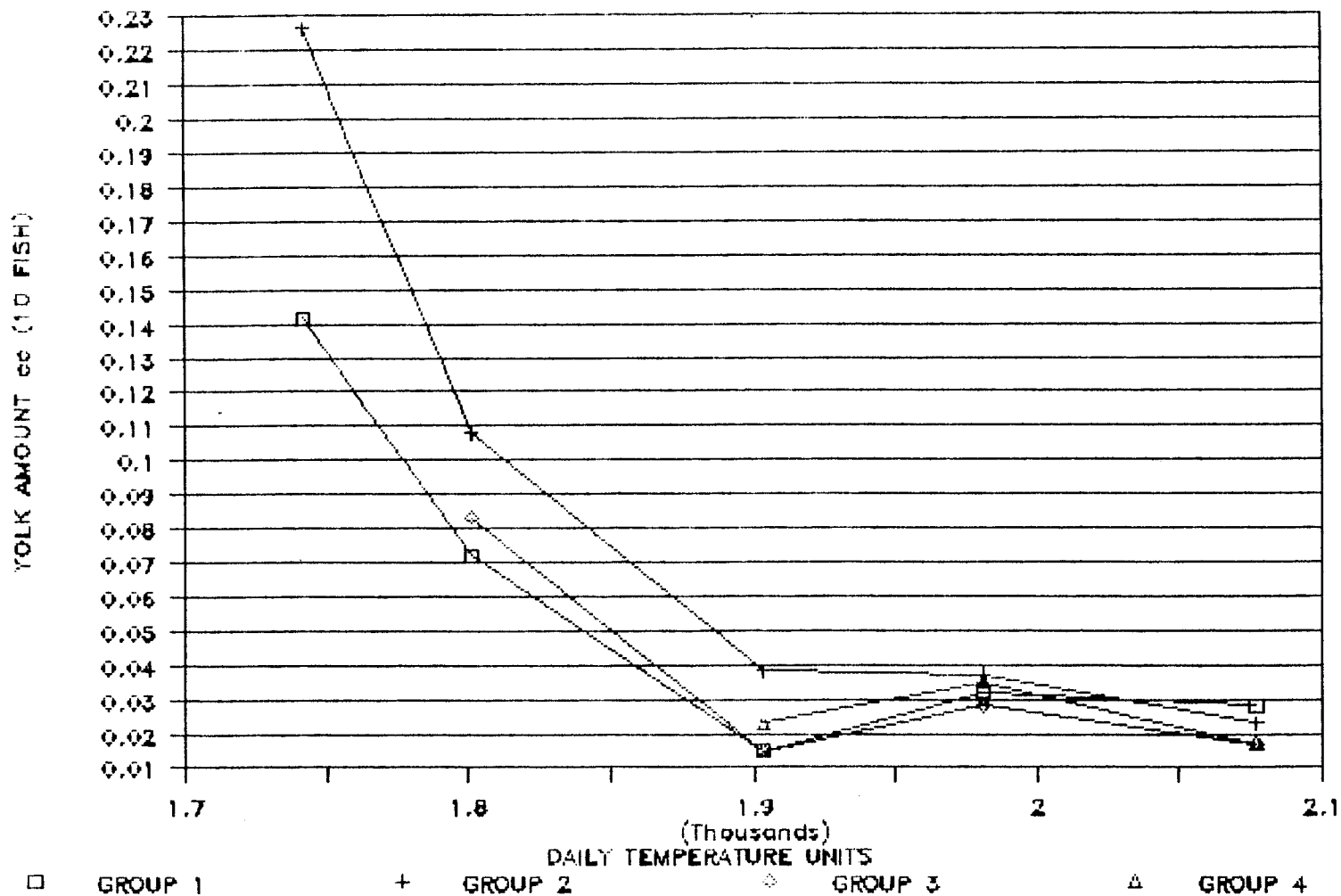


Figure 5. Average yolk absorption rates.

BY 1986 INITIAL FEEDING

COMPARISON OF WEIGHTS

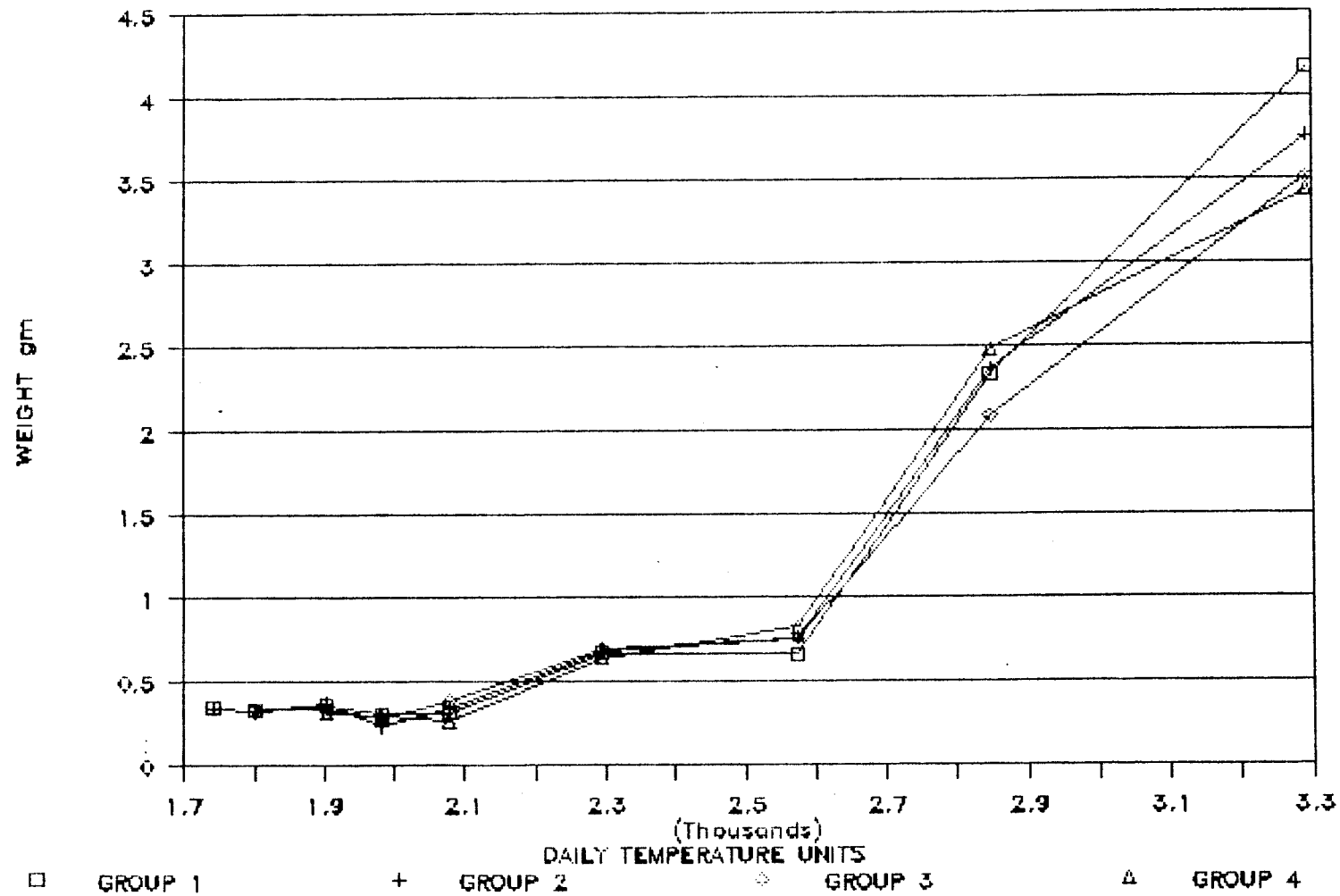


Figure 6. Weight gain versus age of feeding fry.

LITERATURE CITED

- Hutchinson, B. 1986. Final Report McCall Summer Chinook Nutrition Evaluation Study, Idaho Department of Fish and Game. 8 pp.
- Piper, R.G., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, and J.R. Leonard. 1982. Fish Hatchery Management, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 517 pp.

APPENDICES

Appendix 1. The length frequencies of Brood Year 1986 McCall summer chinook salmon smolts at the time of release.

Length	Male	Female
14.5	2	0
15.0	0	0
15.5	0	0
16.0	1	0
16.5	4	0
17.0	9	0
17.5	8	0
18.0	7	0
18.5	10	0
19.0	28	0
19.5	35	0
20.0	75	0
20.5	93	0
21.0	140	0
21.5	115	0
22.0	161	0
22.5	143	0
23.0	136	0
23.5	91	0
24.0	72	0
24.5	42	0
25.0	27	1
25.5	28	0
26.0	10	0
26.5	7	0
27.0	22	3
27.5	14	4
28.0	40	7
28.5	44	8
29.0	67	26
29.5	63	30
30.0	84	40
30.5	75	62
31.0	80	90
31.5	53	64
32.0	64	73
32.5	42	58
33.0	39	47
33.5	18	25
34.0	18	21
34.5	6	12
35.0	9	18
35.5	6	19

Appendix 1. Continued.

Length	Males	Females
36.0	8	26
36.5	4	11
37.0	4	9
37.5	4	9
38.0	3	7
38.5	3	0
39.0	1	0
39.5	1	0
40.0	1	1
40.5	0	0
41.0	1	0
41.5	1	0

Appendix 2. Drugs, chemicals and compounds commonly used at McCall Hatchery.

Compound	Rate	Use	Source
Iodophor	100 ppm titratable Iodine 1 hr.	disinfectant for eggs	Argent Chemical
Sodium Bicarbonate	0.5%	Buffer for Iodophor	common baking soda
Formalin	1,667 ppm 15 minutes	control fungus on eggs	VanWaters & Rodgers
Benzalkonium Chloride	600 ppm 1 hr.	topical disinfectant	Argent Chemical
Chlorine	200 ppm 1 hr.	topical disinfectant	VanWaters & Rodgers
Sodium Thiosulfate	5.6 gm/ gallon of 200 ppm Cl	neutralize Chlorine solution	VanWaters & Rodgers

Appendix 3. Correlation of summer chinook salmon smolts released by the McCall Hatchery and corresponding adult returns.

Brood year	Releases		Returns			Total	Percent return
	Release date	Release number	Jacks	4-year olds	5-year olds		
1978	1980	124,800	124	462	161	747	0.598
1979	1981	248,926	48	272	221	541	0.217
1980	1982	122,247	504	713	151	1,368	1.119
1981	1983	183,896	595	1,259	164	2,018	1.100
1982	1984	269,880	828	1,304	202	2,334	0.865
1983	1985	564,405	1,222	2,113	a	b	b
1984	1986	970,483	386	a	a	b	b
1985	1987	953,300	a	a	a	b	b
1986	1988	1,060,400	a	a	a	b	b

^aThese fish have not returned yet.

^bIncomplete due to unavailable data.

Run date	Jacks	4-year males	4-year females	5-year males	5-year females	Total
1980	186	c	c	c	c	380
1981	124	171	135	31	63	524
1982	48	294	16	12	28	550
1983	504	108	164	85	76	937
1984	595	296	417	135	86	1,529
1985	828	467	792	47	104	2,238
1986	1,222	723	581	52	112	2,690
1987						

^cThese adults were not separated by year class; 194 adults were reported returned to the weir.

Appendix 4. Summary of the Brood Year 1985 tags released.

Tag code	Freeze brand					
	RD-"T"-2		10/30/32		10/30/33	
Total marked	61,989		251,670		61,989	
Total mortality	89		489		89	
Mark loss	12.9%	8,000	1.3%	3,372	0%	0
Marks released	53,900		247,825		61,900	
Total fish released = 1,060,400						
Percent of population marked = 29.21%						

Appendix 5. McCall Hatchery summer Chinook salmon adult return data by year.


Run date	Jacks	Adults	Total
1980	186	194	380
1981	124	400	524
1982	48	502	550
1983	504	433	937
1984	595	934	1,529
1985	828	1,410	2,238
1986	1,222	1,468	2,690

Submitted by:


Thomas S. Frew
Hatchery Superintendent II

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME



Jerry M. Conley, Director



Steven M. Huffaker, Chief
Bureau of Fisheries



Bill Hutchinson
Anadromous Hatcheries Supervisor
